STATE OF THE PRACTICE:
Pavement Type SELECTION

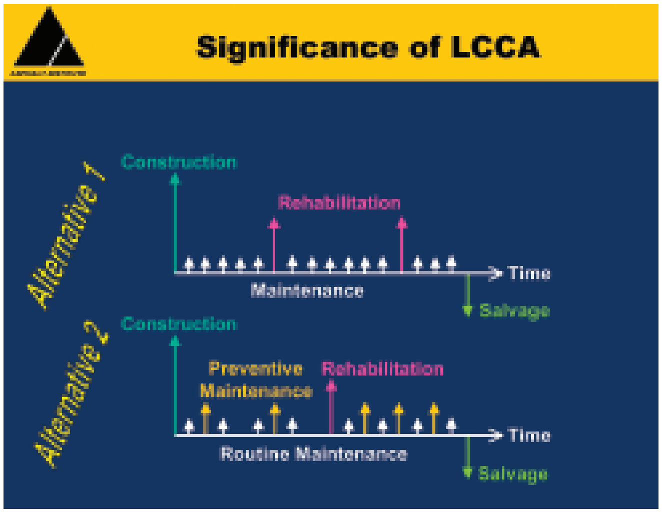
By Mark Buncher, Ph.D., P.E.

There are many pavement type selections available to designers. The options include conventional hot mix asphalt, Portland cement concrete, rubblization, Perpetual Pavement, etc. This article discusses how the pavement selection process is currently being applied.

How Are Decisions Made?

The pavement selection process can be as simple as specifying a certain type of pavement on the basis of traffic level or soil condition, or as complex as evaluating each investment alternative against many weighted factors including life cycle cost. Whatever methodology is used, it should be objective, rational, open, explainable, and most important, based on the best value for the taxpayer.

Many state highway agencies are currently reviewing their pavement type selection processes to ensure they meet these criteria. The process is centralized in some state agencies by having the headquarters make the decision while in other states the process is decentralized and performed by the district office. Other states form pavement type selection committees comprised of individuals from both the DOT HQs and the district who represent various functional groups such as materials, design, maintenance, traffic, etc.



Ensuring Best Value for Tax Dollars

When determining which factors should be considered to ensure the best value for the taxpayer and traveling public, Life Cycle Cost Analysis (LCCA) is clearly recognized as one of the most important. LCCA is a process that compares the long-term economic worth of competing alternative investment options for a project. Various pavement design options are analyzed by considering all initial costs and discounted future costs over a given analysis period, typically 30 to 50 years.

Agency costs include initial construction and future rehabilitation and maintenance. User costs incurred from traffic delays during initial construction and future restoration can and probably should be incorporated, although this will add to the complexity of the analysis.

The Federal Highway Administration (FHWA) strongly encourages the states to use LCCA in analyzing their major pavement investment decisions. Technical guidance and best practice recommendations in conducting LCCA for pavement design is provided in the publication FHWA-SA-98-079. Additional guidance from the FHWA can be found in publication FHWA-SA-98-040, which is a participant's notebook for a two-day workshop on LCCA in Pavement Design referred to as Demonstration Project 115. Software capable of performing LCCA, including the incorporation of user costs in accordance with FHWA recommendations, is available and can be downloaded from the Asphalt Pavement Alliance (APA) web-site at *www.asphaltalliance.com* or from the FHWA.

LCCA Input Assumptions

The key to a truly meaningful LCCA is making accurate input assumptions. Input variables include discount rates, initial and future agency costs, rehabilitation and maintenance activity timing, analysis period, salvage value and, if considered, user costs.

Initial costs and those that occur early in the analysis period will have a greater effect on the LCCA results. Fortunately, agencies generally have a good handle on costs from historical bid records on representative jobs. The average and most prevalent discount rate used by agencies is 4 percent. Higher rates favor alternatives with lower initial costs and higher future costs, while lower discount rates favor alternatives with higher initial costs and lower future costs. Because any salvage value is discounted over the full analysis period, it rarely has a major effect on the LCCA results. One of the most significant input values is the timing of future treatments associated with each investment alternative. It is critical that the assumed performance periods are based on actual historical records and not on perceived service lives. This data can often be extracted from good pavement management systems.

A study by the FHWA of the Long Term Pavement Performance (LTPP) program determined the average asphalt overlay life for 135 test sections in the GPS-6 experiment was more than 15 years (publication FHWA-RD-00-165). Preliminary results of a similar and on-going study analyzing the LTPP program's new conventional asphalt pavements show the average "time to first overlay" to be even greater—around 20 years.

Most agencies prefer to look at performance data for their own pavements, which underscores the importance of collecting performance data for a wide range of conditions (traffic, thicknesses, construction type, environment, soil conditions, etc.).

Example Selection Worksheet

	LCC	Service Life	Traffic Control	Reliable Design	TOTAL SCORE
Weight	50%	25%	15%	10%	
Alt 1	60 / 30	50 / 12.5	80 / 12	50 / 5	59.50
Alt 2	50 / 25	75 / 18.75	70 / 10.5	70 / 7	61.25
Alt 3	40 / 20	75 / 18.75	60 / 9	80 / 8	55.75
Alt 4	30 / 15	100 / 25	50 / 7.5	90 / 9	56.50

Other Factors to Consider

Besides LCCA, there may be other factors an agency may choose to consider when selecting the best investment option. Some of the most common include speed of construction, work zones and safety, lane closures and user delays, reliability of performance, recyclability, noise and roughness.

Asphalt pavements offer advantages with each of these factors. They can be built significantly faster than concrete pavements and can be resurfaced at night or over a weekend. Staging allows intermediate layers to carry traffic and keep lanes open during construction. Asphalt pavements are significantly quieter and smoother compared to other construction materials. And asphalt is 100 percent recyclable, saving both finances and natural resources.

Mark Buncher is the Director of Field Engineering for the Asphalt Institute.

The APA has published a position paper, "Pavement Type Selection Process," which discusses in detail the advantages of asphalt pavement for each of the factors listed in the 1993 AASHTO Design Guide, Appendix B. It can be ordered for $1 per copy from the APA website: www.asphaltalliance.com.